भारतीय मानक
Indian Standard

IS 15704 : 2018

स्वचल वाहन — व्यावसायिक वाहनों के लिए रिट्रेडेड वातिल टायर — विशिष्टि

(पहला पुनरीक्षण)

Automotive Vehicles — Retreaded Pneumatic Tyres for Commercial Vehicles — Specification

(First Revision)

ICS 83.160.10

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May 2018
Price Group 7

Automotive Tyres, Tubes and Rims Sectional Committee, TED 7

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rim Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 2006. This revision has been undertaken in view of amendments to ECE Regulation 109 and revision in IS 15636. Following are some of the salient features of this standard:

a) New definitions has been added;
b) Requirement of tyre strength test has been done away with as ISI mark casing is used for retreading;
c) Typographical errors have been corrected and appropriate words have been added to convey the correct meaning; and
d) Criterion for conformity has been modified.

The following standards may be referred for valve, valve accessories and terminology of automotive vehicles:

IS No.	*Title*
9081 : 2001	Automotive vehicles — Valves and valve accessories for pneumatic tyres — Specification (*third revision*)
10939 : 2000	Designation system for tyre tube valves for automotive vehicles (*first revision*)
14272 : 2011	Automotive vehicles — Types — Terminology (*first revision*)

In this standard S1units have been used, the unit of force, in Newton (N), of tyre load, in kilogram (kg) and of pressure, in Pascal (Pa). Their relationship are given below for information:

1 kgf = 9.806 65 N

1 kgf/cm^2 = 98.066 kPa

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — RETREADED PNEUMATIC TYRES FOR COMMERCIAL VEHICLES — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes to the production of retreaded tyres intended to be fitted, but not only, for vehicles in categories M2, M3, N, T3 and T4. It does not, however, apply to the following:

a) Retreaded tyres with a speed capability below 80 km/h.

b) Tyres originally produced without speed symbols and/or load indices.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
10694 (Part 30) : 2009	Automotive vehicles — Rims — General requirements: Part 3 Commercial vehicles rims (*first revision*)
15636 : 2012	Automotive vehicles — Pneumatic tyres for commercial vehicles — Diagonal and radial ply — Specification.

3 DEFINITIONS

3.1 The nomenclature used is given in Fig. 1.

3.2 Structure — Structure of pneumatic tyre means the technical characteristics of the tyre's carcass. The following structures are distinguished in particular:

a) *Diagonal or bias-ply* — Pneumatic-tyre structure in which the ply cords extend to the

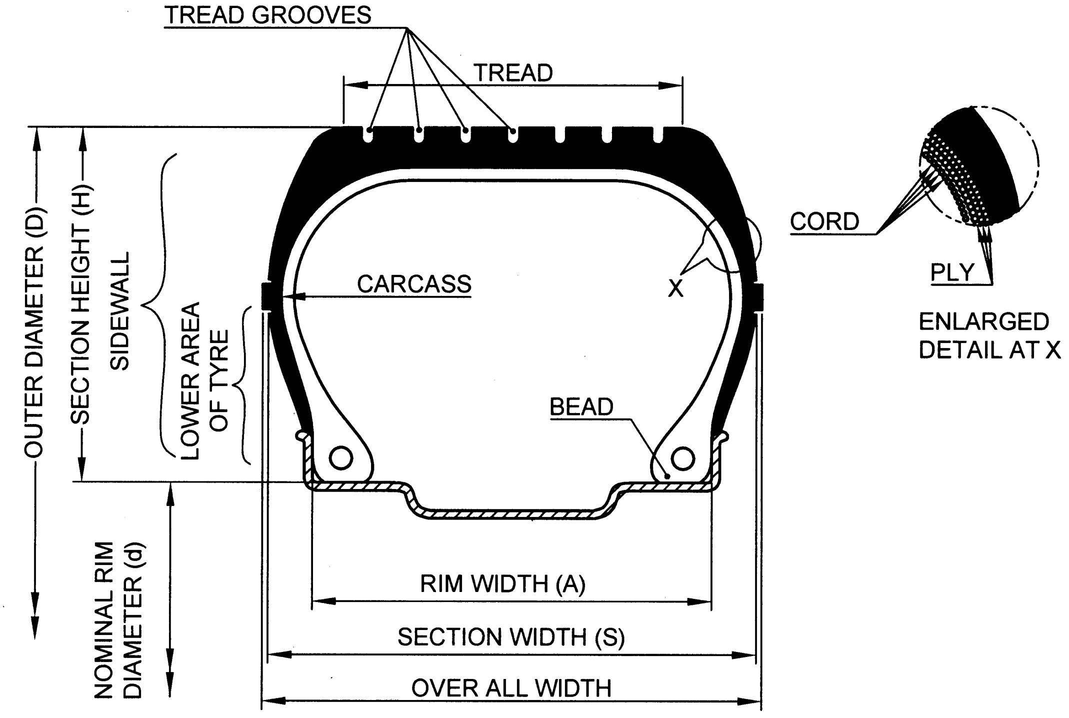

FIG. 1 NOMENCLATURE OF TYRE

beads and are laid at alternate angles substantially less than 90° to the centreline of the tread.

b) *Radial* — Pneumatic-tyre structure in which the ply cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilized by an essentially in-extensible circumferential belt.

3.3 Category of Use

3.3.1 *Normal Tyre* — Tyre intended for normal road use only.

3.3.2 *Special Use Tyre* — Tyre intended for mixed use, both on and off road and/or at restricted speed.

3.3.3 *Snow Tyre* — Tyre whose tread pattern, or tread pattern and structure is primarily designed to ensure, in mud and fresh or melting snow, a performance better than that of a normal tyre. The tread pattern of a snow tyre generally consists of groove (rib) and /or solid block elements more widely spaced than on a normal tyre.

3.4 Bead — Part of a pneumatic-tyre which is of such shape and structure as to fit the rim and hold the tyre on it (*see* Fig.1).

3.5 Cord — Strands forming the fabric of the plies in pneumatic tyre.

3.6 Ply — A layer of rubber-coated parallel cords.

3.7 Breaker (Diagonal) — Intermediate rubberised fabric layers/plies between the carcass and the tread, which helps bonding as well as protects the casing from road shocks.

3.8 Protective Breaker — Applies to a radial ply tyre and means an optional intermediate ply between the tread and belt to minimize damage to the belt.

3.9 Chafer — Material in the bead area to protect the carcass against chafing or abrasion by the wheel rim.

3.10 Carcass — Structural part of a pneumatic tyre other than the tread and outermost 'rubber' side walls which, when inflated, supports the load.

3.11 Tread — Part of a pneumatic tyre which is designed to come into contact with the ground and through which driving, braking and cornering forces are transmitted. It protects the carcass against mechanical damage and contributes to ground adhesion.

3.12 Side Wall — Part of a pneumatic tyre between the tread and the area designed to be covered by the rim flange.

3.13 Lower Area of Tyre — Area included between the line of maximum section width of a tyre and area designed to be covered by the edge of rim.

3.14 Tread Groove — Space between the adjacent ribs or blocks in the tread pattern (*see* Fig.1).

3.15 Section Width (*S*) — Linear distance between the outsides of the side walls of an inflated pneumatic tyre, when fitted to the specified measuring rim, and excluding elevations due to labelling (marking), decoration or protective bands or ribs.

3.16 Overall Width — Linear distance between the outsides of the sidewalls of an inflated pneumatic tyre, when fitted to the specified measuring rim and including labelling (marking), decoration and protective bands or ribs.

3.17 Section Height (*H*) — Distance equal to half the difference between the outer diameter of the tyre and the nominal rim diameter.

3.18 Nominal Aspect Ratio (R_a) — Hundred times the number obtained by dividing the number expressing the nominal section height (H) by the number expressing the nominal section width (S), both dimensions being in the same units.

3.19 Outer Diameter (*D*) — Overall diameter of an inflated, newly retreaded tyre.

3.20 Tyre-Size Designation — A designation showing,

a) *Nominal section width* — This shall be expressed in millimeters, except in cases of tyres for which the size designation is shown in the col 2 of the Tables 6 to 25 of IS 15636.

b) *Nominal aspect ratio* — Except in cases of tyres for which the size designation is shown in the col 2 of the Tables 6 to 25 of IS 15636.

c) *Conventional number 'd'* — Denoting the nominal rim diameter of the rim and corresponding to its diameter expressed either by codes (numbers below 100) or in millimetres (numbers above 100). Numbers corresponding to both types of measurements may be used in the designation.

d) An indication of the tyre to rim fitment configuration when it differs from the standard configuration and is not already expressed by the symbol *'d'* denoting the rim diameter code.

3.21 Nominal Rim Diameter (*d*) — Diameter of the rim on which a tyre is designed to be mounted.

3.22 Rim — Support, either for a tyre-and-tube assembly, or for a tubeless tyre, on which the tyre beads are seated [*see* IS 10694 (Part 3)].

3.23 Chunking — Breaking away of pieces of rubber from the tread.

3.24 Cord Separation — Parting of the cords from their rubber coating.

3.25 Ply Separation — Parting of adjacent plies.

3.26 Tread Separation — Pulling away of the tread from the carcass.

3.27 Service Description — Specific combination of the load index and speed symbol of the tyre.

3.28 Load Index — A numerical code which indicates the load the tyre can carry at the speed corresponding to the associated speed symbol and when operated in conformity with the service conditions specified by the manufacturer. A pneumatic tyre can have more than one load index to indicate its load capacity when used in single or dual formation. The list of load indices and the corresponding loads are given in Table 1.

3.29 SPEED SYMBOL

3.29.1 An alphabetical symbol indicating the speed at which the tyre can carry the load given by the associated load index.

Table 1 Correlation Between Load Index and Corresponding Maximum Load to be Carried

(*Clause* 3.28)

Load Index (LI) (1)	Corresponding Maximum Load to be Carried kg (2)	Load Index (LI) (3)	Corresponding Maximum Load to be Carried kg (4)	Load Index (LI) (5)	Corresponding Maximum Load to be Carried kg (6)	Load Index (LI) (7)	Corresponding Maximum Load to be Carried kg (8)
60	250	97	730	134	2 120	171	6150
61	257	98	750	135	2 180	172	6300
62	265	99	775	136	2 240	173	6500
63	272	100	800	137	2 300	174	6700
64	280	101	825	138	2 360	175	6900
65	290	102	850	139	2 430	176	7100
66	300	103	875	140	2 500	177	7 300
67	307	104	900	141	2 575	178	7 500
68	315	105	925	142	2 650	179	7 750
69	325	106	950	143	2 725	180	8 000
70	335	107	975	144	2 800	181	8 250
71	345	108	1 000	145	2 900	182	8 500
72	355	109	1 030	146	3 000	183	8 750
73	365	110	1 060	147	3 075	184	9 000
74	375	111	1 090	148	3 150	185	9 250
75	387	112	1 120	149	3 250	186	9 500
76	400	113	1 150	150	3 350	187	9 750
77	412	114	1 180	151	3 450	188	10 000
78	425	115	1 215	152	3 550	189	10 300
79	437	116	1 250	153	3 650	190	10 600
80	450	117	1 285	154	3 750	191	10 900
81	462	118	1 320	155	3 875	192	11 200
82	475	119	1 360	156	4 000	193	11 500
83	487	120	1 400	157	4 125	194	11 800
84	500	121	1 450	158	4 250	195	12 150
85	515	122	1 500	159	4 375	196	12 500
86	530	123	1 550	160	4 500	197	12 850
87	545	124	1 600	161	4 625	198	13 200
88	560	125	1 650	162	4 750	199	13 600
89	580	126	1 700	163	4 875	200	14 000
90	600	127	1 750	164	5 000		
91	615	128	1 800	165	5 150		
92	630	129	1 850	166	5 300		
93	650	130	1 900	167	5 450		
94	670	131	1 950	168	5 600		
95	690	132	2 000	169	5 800		
96	710	133	2 060	170	6 000		

3.29.2 Speed symbols and corresponding speeds are shown in the Table 2.

Table 2 Speed Category Symbol and Maximum Speed

(*Clause* 3.29.2)

Sl No.	Speed Category Symbol	Maximum Speed km/h
(1)	(2)	(3)
i)	F	80
ii)	G	90
iii)	J	100
iv)	K	110
v)	L	120
vi)	M	130
vii)	N	140
viii)	P	150
ix)	Q	160
x)	R	170
xi)	S	180
xii)	T	190
xiii)	U	200
xiv)	H	210

3.30 Unique Point — A number of truck tyre sizes carry a second load speed index marked on the sidewall showing additional load/speed operating conditions in order to satisfy particular requirements.

$$152/148M\,\frac{153}{150}\,j$$

This is known as the 'unique point' and is situated after the principal load/speed index as shown below:

The unique point must not be used for calculating a load capacity variation given in **3.31**.

3.31 Load-Capacity Variation with Speed — An alternative load capacity for the tyre when used at a speed different from that indicated by the speed symbol in the normal service description. The permissible variations are given in Table 3 and Table 4.

3.32 Retreading — Generic term for reconditioning a used tyre by replacing the worn tread with new material. It may also include renovation of the outermost sidewall surface and replacement of the crown plies or the protective breaker. It covers the following process methods:

a) *Top-capping* — Replacement of the tread.

b) *Re-capping* — Replacement of the tread and with the new material extending over part of the sidewall.

c) *Bead to bead* — Replacement of the tread and renovation of the sidewall including all or part of the lower area of the tyre.

3.33 Casing — Worn tyre comprising carcass and remaining tread and sidewall material.

3.34 Buffing — Process of removing old material from the casing to prepare the surface for the new material.

3.35 Repair — Remedial work carried out to damaged casings within recognized limits.

3.36 Tread Material — Material in a condition suitable for replacing the worn tread. It can be in several forms, for example:

a) *Camel-back/Slab* — Pre-cut lengths of material which have been extruded to give the required cross section profile and subsequently fitted cold to the prepared casing. The new material shall be cured.

b) *Strip-wound* — Ribbon of tread material which is directly extruded and wound on to the prepared casing and build up to the required cross sectional contour. The new material shall be cured.

c) *Direct extrusion* — The tread material extruded to give the required cross sectional profile and directly extruded on the prepared casing. The new material shall be cured.

d) *Pre-cured* — The previously formed and cured tread applied directly to the prepared casing. The new material shall be bonded to the casing.

3.37 Sidewall Veneer — The material used to cover the sidewalls of the casing thereby allowing the required markings to be formed.

3.38 Cushion Gum— The material used as a bonding layer between new tread and casing and for repairing minor damage.

3.39 Cement — An adhesive solution to hold new materials in place prior to the curing process.

3.40 Cure — The terms used to describe the change in physical properties of the new material which is brought about usually by the application of heat and pressure for a set period of time under controlled conditions.

4 REQUIREMENTS

4.1 Conditions Before Retreading

4.1.1 Tyres shall be clean and dry before inspection.

4.1.2 Before buffing, each tyre shall be thoroughly examined both internally and externally to ensure its suitability for retreading.

Table 3 Variation of Load Capacity with Speed and Inflation Pressure Compensation Commercial Vehicles Tyres — Radial and Diagonal Ply

(*Clause* 3.31)

Sl No.	**Speed** km/h	**Variation of Load Capacity,** Percent						**Inflation Pressure Compensation,** Percent
		Load Indices ≥ 122[1]						
		Speed Symbol						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		F	G	J	K	L	M	
i)	0	+150	+150	+150	+150	+150	+150	+40
ii)	5	+110	+110	+110	+110	+110	+110	+40
iii)	10	+80	+80	+80	+80	+80	+80	+30
iv)	15	+65	+65	+65	+65	+65	+65	+25
v)	20	+50	+50	+50	+50	+50	+50	+21
vi)	25	+35	+35	+35	+35	+35	+35	+17
vii)	30	+25	+25	+25	+25	+25	+25	+13
viii)	35	+19	+19	+19	+19	+19	+19	+11
ix)	40	+15	+15	+15	+15	+15	+15	+10
x)	45	+13	+13	+13	+13	+13	+13	+9
xi)	50	+12	+12	+12	+12	+12	+12	+8
xii)	55	+11	+11	+11	+11	+11	+11	+7
xiii)	60	+10	+10	+10	+10	+10	+10	+6
xiv)	65	+7.5	+8.5	+8.5	+8.5	+8.5	+8.5	+4
xv)	70	+5.0	+7.0	+7.0	+7.0	+7.0	+7.0	+2
xvi)	75	+2.5	+5.5	+5.5	+5.5	+5.5	+5.5	+1
xvii)	80	0	+4.0	+4.0	+4.0	+4.0	+4.0	0
xviii)	85		+2.0	+3.0	+3.0	+3.0	+3.0	0
xix)	90		0	+2.0	+2.0	+2.0	+2.0	0
xx)	95			+1.0	+1.0	+1.0	+1.0	0
xxi)	100			0	0	0	0	0
xxii)	105				0	0	0	0
xxiii)	110				0	0	0	0
xxiv)	115					0	0	0
xxv)	120					0	0	0
xxvi)	125						0	0
xxvii)	130						0	0

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[1] Load indices refer to a single operation.

4.1.3 Tyres where damage is visible, which has resulted from overload or under inflation shall not be retreaded.

4.1.4 Tyres showing any of the following damage shall not be accepted for retreading.

4.1.4.1 *General*

a) Non- repairable rubber cracking extending through to the carcass,
b) Carcass break up,
c) Appreciable oil or chemical attack, and
d) Damaged or broken bead core.

4.1.4.2 *Conditions outside specified limits of repairability*

a) Carcass penetrations or damage after preparation for repair,
b) Multiple damage too close together,
c) Substantial deterioration of inner lining,
d) Bead damage,
e) Exposed carcass cords,
f) Loose cords,
g) Belt ply separation,
h) Permanently deformed or kinked (steel) carcass cords,

j) Circumferential cracking above the bead, and

k) Corroded steel cord or bead wire.

NOTE — **4.1.4.2** (a) is applicable to radial tubeless tyres only.

4.2 Preparation

4.2.1 After buffing, and before the application of new material, each tyre shall be thoroughly re-examined to ensure its continued suitability for retreading.

Table 4 Variation of Load Capacity with Speed and Inflation Pressure Compensation Commercial Vehicles Tyres — Radial and Diagonal Ply

(*Clause* 3.31)

Sl No.	**Speed** km/h	**Variation of Load Capacity (Percent)**													**Inflation Pressure Compensation** Percent
		Load Indices ≤ 121 1)													
		Speed Symbol													
		F	G	J	K	L	M	N	P	Q	R	S	T	H	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	0	+150	+150	+150	+150	+110	+110	+110	+110	+110	+110	+110	+110	+110	+40
ii)	5	+110	+110	+110	+110	+90	+90	+90	+90	+90	+90	+90	+90	+90	+35
iii)	10	+80	+80	+80	+80	+75	+75	+75	+75	+75	+75	+75	+75	+75	+35
iv)	15	+65	+65	+65	+65	+60	+60	+60	+60	+60	+60	+60	+60	+60	+30
v)	20	+50	+50	+50	+50	+50	+50	+50	+50	+50	+50	+50	+50	+50	+30
vi)	25	+35	+35	+35	+35	+42	+42	+42	+42	+42	+42	+42	+42	+42	+30
vii)	30	+25	+25	+25	+25	+35	+35	+35	+35	+35	+35	+35	+35	+35	+30
viii)	35	+19	+19	+19	+19	+29	+29	+29	+29	+29	+29	+29	+29	+29	+30
ix)	40	+15	+15	+15	+15	+25	+25	+25	+25	+25	+25	+25	+25	+25	+30
x)	45	+13	+13	+13	+13	+22	+22	+22	+22	+22	+22	+22	+22	+22	+28
xi)	50	+12	+12	+12	+12	+20	+20	+20	+20	+20	+20	+20	+20	+20	+25
xii)	55	+11	+11	+11	+11	+17.5	+17.5	+17.5	+17.5	+17.5	+17.5	+17.5	+17.5	+17.5	+22
xiii)	60	+10	+10	+10	+10	+15.0	+15.0	+15.0	+15.0	+15.0	+15.0	+15.0	+15.0	+15.0	+18
xiv)	65	+7.5	+8.5	+8.5	+8.5	+13.5	+13.5	+13.5	+13.5	+13.5	+13.5	+13.5	+13.5	+13.5	+15
xv)	70	+5.0	+7.0	+7.0	+7.0	+12.5	+12.5	+12.5	+12.5	+12.5	+12.5	+12.5	+12.5	+12.5	+15
xvi)	75	+2.5	+5.5	+5.5	+5.5	+11.0	+11.0	+11.0	+11.0	+11.0	+11.0	+11.0	+11.0	+11.0	+14
xvii)	80	0	+4.0	+4.0	+4.0	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+12
xviii)	85		+2.0	+3.0	+3.0	+8.5	+8.5	+8.5	+8.5	+8.5	+8.5	+8.5	+8.5	+8.5	+10
xix)	90		0	+2.0	+2.0	+7.5	+7.5	+7.5	+7.5	+7.5	+7.5	+7.5	+7.5	+7.5	+9
xx)	95			+1.0	+1.0	+6.5	+6.5	+6.5	+6.5	+6.5	+6.5	+6.5	+6.5	+6.5	+8
xxi)	100			0	0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+6
xxii)	105				0	+3.75	+3.75	+3.75	+3.75	+3.75	+3.75	+3.75	+3.75	+3.75	+4
xxiii)	110				0	+2.5	+2.5	+2.5	+2.5	+2.5	+2.5	+2.5	+2.5	+2.5	+2
xxiv)	115					+1.25	+1.25	+1.25	+1.25	+1.25	+1.25	+1.25	+1.25	+1.25	+1
xxv)	120					0	0	0	0	0	0	0	0	0	0
xxvi)	130						0	0	0	0	0	0	0	0	0
xxvii)	140							0	0	0	0	0	0	0	0
xxviii)	150								0	0	0	0	0	0	0
xxix)	160									0	0	0	0	0	0
xxx)	170										0	0	0	0	0
xxxi)	180											0	0	0	0
xxxii)	190												0	0	0
xxxiii)	200													0	0
xxxiii)	210													0	0

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1) Load index/indices refer to a single operation

4.2.2 The entire surface to which new material is to be applied shall have been prepared without overheating. The buffed surface texture shall not contain deep buffing lacerations or loose material.

4.2.3 Where precured material is to be used the contours of the prepared area shall meet the requirements of the material manufacturer.

4.2.4 Damage caused during buffing must not exceed defined limits of repair.

4.2.5 Buffing damage to diagonal ply tyres shall not extend beyond the outermost carcass ply in the crown area. It shall be assumed that the first ply encountered is a carcass ply unless a breaker can be positively identified. If a breaker is fitted, localized damage is permissible.

4.2.6 Localized buffing damage to the belt of radial tyres is permissible. For larger damage it is permissible for the complete belt or sections of the belt to be replaced. Where a protective breaker is fitted, and can be positively identified as such, if it is damaged it is permissible to remove it and it need not be renewed.

4.2.7 Exposed steel parts shall be treated as soon as possible with appropriate material as defined by the manufacturer of that appropriate material.

4.3 Retreading

4.3.1 The retreader must ensure that either the manufacturer or the supplier of repair materials, including patches, is responsible for the following:

a) Defining method(s) of application and storage, if requested by the retreader, in the local language of the state in which the materials are to be used,

b) Defining limits of damage for which the materials are designed, if requested by the retreader, in the local language of the state in which the materials are to be used,

c) Ensuring that reinforced patches for tyres, if correctly applied in carcass repairs, are suitable for the purpose,

d) Ensuring that patches are capable of withstanding twice the maximum inflation pressure as given by the tyre manufacturer,

e) Ensuring the suitability of any other repair materials for the service intended.

4.3.2 The retreader shall be responsible for the correct application of the repair material and for ensuring that the repair is free from any defects, which may affect the satisfactory service life of the tyre.

4.3.3 The area surrounding a reinforced repair to a sidewall or shoulder of a radial ply tyre may bulge slightly when the tyre is fitted and inflated to the recommended operating pressure. Reinforced repair materials with physical properties that restrict the height of the bulge not more than 4 mm shall be used.

4.3.4 The retreader shall ensure that either the manufacturer or the supplier of tread and sidewall material issues specifications concerning the conditions of storage and use of the material in order to guarantee the material's qualities. If requested by the retreader, this information shall be in the local language of the state in which the materials are to be used.

4.3.5 The retreader must ensure that the repair material and/or compound are documented in a manufacturer's or supplier's certificate. The material compound shall be as per the details/ specification of retreading material specifications/ retreader. Bonding gum, cushion gum, vulcanizing solution and tread-rubber used for tyre retreading shall be compatible and preferable of the same make.

4.3.6 The processed tyre shall be cured as soon as possible after the completion of all repairs and building-up operations and at the latest according to the material manufacturer's specifications.

4.3.7 The tyre shall be cured for the length of time and at the temperature and pressure, appropriate to, and specified for the materials and processing equipment used. The dimensions of the mould shall be appropriate to the thickness of the new material and the size of the buffed tyre.

4.3.8 The thickness of original material after buffing and the average thickness of any new material under the tread pattern, after retreading shall be:

4.3.8.1 For diagonal (bias-ply) and radial ply tyres (mm) (*see* Fig. 2):

$3 \leq (A+B) \leq 13$: *Min* 3.0 mm; *Max* 13.0 mm

$A \geq 2$: *Min* 2.0 mm

$B > 0$: *Min* 0.0 mm at repair spots

4.3.9 The service description of a retreaded tyre shall not show either a higher speed symbol or a higher load index than that of the original first life.

4.3.10 Upgrading of the service description given in **4.3.9** shall only be permitted for the first retread of an original, first life tyre. Tyres, which have been previously retreaded, shall not have either the speed symbol or the load index raised above that shown on the used casing.

4.3.11 Tread wear indicators shall be incorporated as follows:

a) The retreaded pneumatic tyre shall include not less than six transverse rows of tread wear

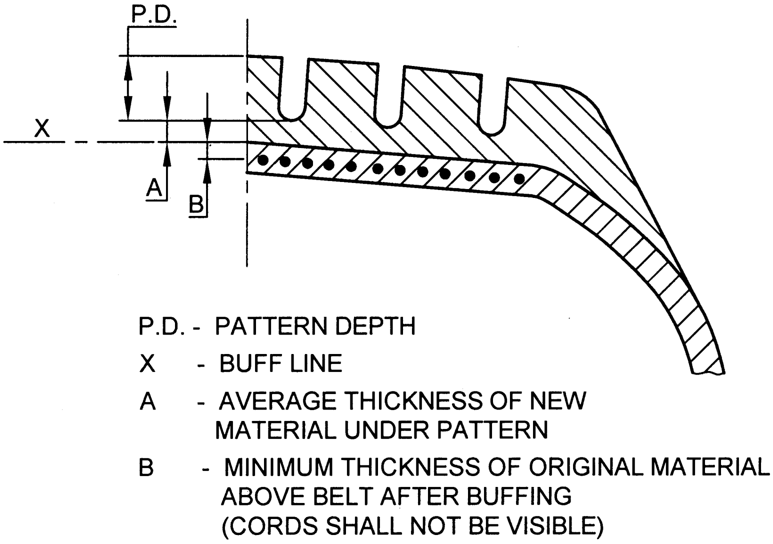

P.D.
X
A
B
P.D. - PATTERN DEPTH
X - BUFF LINE
A - AVERAGE THICKNESS OF NEW MATERIAL UNDER PATTERN
B - MINIMUM THICKNESS OF ORIGINAL MATERIAL ABOVE BELT AFTER BUFFING (CORDS SHALL NOT BE VISIBLE)

FIG. 2 PATTERN DEPTH AND BUFF LINE

indicators, approximately equispaced and situated in the principal grooves of the tread. The tread wear indicators shall be such that it cannot be confused with the material ridges between the ribs or blocks of the tread.

b) However, in the case of tyres designed for mounting on rims of a nominal diameter of code 12 or less, four rows of tread wear indicators are permissible.

c) The tread wear indicators shall provide a means of indicating, with a tolerance of $^{+0.60}_{-0.0}$ when the tread grooves are no longer more than 1.6 mm deep.

d) The height of the tread wear indicators shall be determined by measuring the difference between the depth from the tread surface to the top of the tread wear indicators and the base of the tread grooves, close to the slope at the base of tread wear indicators.

4.4 Inspection

4.4.1 After curing, whilst a degree of heat is retained in a tyre, each retreaded tyre shall be examined to ensure that it is free from any apparent defects. During or after retreading the tyre must be inflated to at least 150 kPa for examination. Where there is any apparent defect in the profile of the tyre (for example blister, depression, etc), the tyre shall be specifically examined to determine the cause of the defect.

4.4.2 Before, during or after retreading, the tyre shall be checked at least once, for the integrity of its structure, by means of a suitable inspection method.

4.4.3 For the purposes of quality control, a number of retreaded tyres shall be subjected to destructive and/or non-destructive testing or examination. The quantity of tyres checked and the results shall be recorded.

4.4.4 After retreading, the dimensions of the retreaded tyre, when measured in accordance with Annex C, shall conform either to dimensions calculated according to the procedure in **5** or to those given in Annex C of IS 15636. Note that the maximum outer diameter of a retreaded tyre may be up to 1.5 percent greater than the maximum outer diameter of a new original tyre.

4.4.5 Tread wear indicators shall conform to the requirements of **4.3.11**.

5 TYRE DIMENSIONS

5.1 Tyre dimensions namely section width and outer diameter and profiles shall be compatible with the appropriate rims. The method of measurement of tyre dimensions is given in Annex A.

5.1.1 *Section Width of Tyre*

For the existing types of tyres whose designations are given in the col 2 of the Tables 6 to 25 of IS 15636, the actual measured section width shall be within the minimum section width and maximum overall width values specified those tables.

NOTE — Adjustment to tyre section width/overall width — Within the parameters of specified permissibility of a wider or narrower rim than the recommended rim size, the guidelines for the necessary adjustment are — Sectional width or overall width: 5 mm increase or reduction (as applicable) for every 0.50 difference in nominal rim width.

5.1.2 *Tyre Outer Diameter*

For the existing types of tyres whose designations are given in the col 2 of the Tables 6 to 25 of IS 15636, the actual measured outer diameter shall be within the minimum and maximum diameter values specified in those tables.

5.1.3 For the tyre sizes listed in Tables 6 to 25 of IS 15636, but ply rating /and or speed symbol and load-inflation details are other than those given corresponding to tyre sizes in the tables, the section width and outer diameter shall be determined as follows:

a) Actual measured section width shall be within the minimum section width and maximum overall width values specified in Tables 6 to 25 of IS 15636.

b) Actual measured outer diameter shall be within the minimum and maximum diameter valuesspecified in Tables 6 to 25 of IS 15636.

5.1.4 For code designated (diagonal or radial) sizes which are not listed in Tables 6 to 25 of IS 15636, the section width and outer diameter shall be verified against the specification declared by the manufacturer.

5.1.5 For metric designated tyres (diagonal or radial) which are not listed in Tables 6 to 25 of IS 15636, the section width and outer diameter shall be calculated using the following formulae:

a) Section width of tyre :

$$S = S_1 + K\,(A - \mathrm{A}_1)$$

where

S = section width measured on measuring rim, in mm ;

S_1 = nominal section width, as set out on the tyre sidewall in the tyre size designation, in mm;

A = width of the measuring rim, as shown by the manufacturer in the technical specification, in mm; and

A_1 = theoretical rim width, in mm.

NOTES

1 A_1 shall be taken to equal S_1 multiplied by the factor X as specified by the manufacturer, and K shall be taken equal to 0.4.

2 The actual measured overall width of the tyre may be less than the section width determined as detailed in this clause.

3 The actual measured overall width may also exceed the section width determined as detailed in this clause by value of 4 percent in case of radial ply tyre and by 8 percent in case of diagonal (bias-ply) tyres.

However, for tyres with normal section width exceeding 305 mm intended for dual mounting (twinning), the value determined as detailed in this clause shall not be exceeded by more than 2 percent for radial ply tyres with nominal aspect ratio higher than 60 or 4 percent for diagonal (bias-ply) tyres.

b) Outer diameter of the tyre:

$$D = d + 2\,H$$

where

D = outer diameter expressed, in mm;

d = conventional number denoting the nominal rim diameter expressed in mm [*see* **3.20** (c)]. When the conventional number is given by codes, the value, in mm, is obtained by multiplying such number by 25.4;

H = nominal section height in mm = $0.01 \times R_a$ x S_1

where

R_a = nominal aspect ratio; and

S_1 = nominal section width, in mm.

NOTE — R_a and S_1 are as shown on the sidewall of the tyre in the tyre-size designation in conformity with the requirements of **3.20**.

The outer tyre diameter shall not be outside the minimum and maximum diameter values obtained from the following formula:

$$D_{\text{min}} = d + (2H \times a)$$

$$D_{\text{max}} = d + (2H \times b)$$

NOTES

1 H and d are as defined in **5.1.3** (b).

2 Coefficients a and b are respectively:

a	0.97		
		Radial	*Diagonal*
b	For normal use tyres	1.04	1.07
	For special use tyres	1.06	1.09

6 ENDURANCE TEST

6.1 Each type of pneumatic tyres, other than the types mentioned in **7.1** shall undergo the endurance test. The sample shall conform to the requirements given in **6.1.1** and **6.1.2** when tested as per the method given in Annex B.

6.1.1 After undergoing the endurance test, the tyre shall not exhibit any tread separation, ply separation, cord separation, chunking or broken cords.

6.1.2 The outer diameter of the tyre, measured 6h after the endurance test, shall not differ by more than ± 3.5 percent from the outer diameter as measured before the test.

7 LOAD/SPEED PERFORMANCE TEST

7.1 Each type of pneumatic tyres having a speed symbol Q and above and marked with,

a) load index in single121 or less; or

b) load index in single 122 and above and with the additional marking C, or LT, included in the tyre size designation shall undergo load/speed performance test.

The sample shall conform to the requirements given in **7.1.1,** when tested as per the method given in Annex C.

7.1.1 After undergoing the load/speed performance test, the tyre shall not exhibit any tread separation, ply separation, cord separation, chunking or broken cords.

8 MARKINGS

8.1 An example of the arrangement of retreaded tyre markings is given in Annex D.

8.2 Retreaded tyres shall display on both sidewalls in the case of symmetrical tyres and at least on the outer sidewall in the case of asymmetrical tyres.

8.2.1 The brand name or trade-mark.

8.2.2 The tyre size designation given in **3.21**.

8.2.3 An indication of the structure as follows:

a) On diagonal (bias-ply) tyres, no indication or the letter 'D' placed in front of the rim-diameter marking.
b) On radial-ply tyres; the letter 'R' placed in front of the rim-diameter marking and optionally the word 'RADIAL'.
c) On bias belted tyres, the letter 'B' placed in front of the rim-diameter marking and in addition the word 'BIAS-BELTED'.

8.2.4 The service description comprising,

a) an indication of the tyre's nominal load capacity/capacities in the form of the load Index/indices given in **3.28**, and
b) an indication of the tyre's nominal speed capability in the form of the symbol given in **3.29**.

8.2.5 If applicable, one alternative service description, the unique point, comprising the following:

a) An indication of the tyre's nominal load capacity/capacities in the form of the load index or max load /indices given in **3.28**.
b) An indication of the tyre's nominal speed capability in the form of the symbol given in **3.29**.

8.2.6 The word 'TUBELESS', if the tyre is designed for use without an inner tube.

8.2.7 The inscription M+S or MS or M.S. or M&S in the case of snow tyre.

8.2.8 Tyre manufactured using the 'bead to bead' process as defined in **3.36** (c) or any process in which the sidewall material is renewed, shall have the identification referred to in **3.20** (d), placed only immediately after the rim diameter marking referred to in **3.20** (c).

8.2.9 The suffix 'C' or 'LT' following the rim diameter marking referred to in **3.20** (c). and, if applicable, after the tyre to rim fitment configuration symbol referred to in **3.20** (d).

8.2.10 The date of retreading shall be as follows:

In the form of month and year code in which the tyre was retreaded. For example, the marking MAR 14 could indicate a tyre which was retreaded in the month of March of the year 2014. (OR) In the form of a group of four digits, the first two showing the week number and the second two showing the year in which the tyre was retreaded. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking '2514' could indicate a tyre which was retreaded in weeks 25 of the year 2014.

This date code may be marked on one sidewall only.

8.2.11 In the case of tyres which can be regrooved, the symbol 'U' in a circle at least 20 mm diameter, or the word 'REGROOVABLE', moulded into or on to each sidewall.

8.2.12 An indication by means of the kPa or bar or kg/cm^2 or any combination of this units of the inflation pressure to be adopted for the load/speed endurance tests. This indication may be placed on one sidewall only.

8.2.13 The term 'RETREAD' at the request of retreader, the same term in other languages may also be added.

8.3 The markings shall be clearly legible and mould on to or into the tyre or shall be permanently marked on to the tyre.

8.4 As far as any of the original manufacturer's specifications are still legible after the tyres have been retreaded, they shall be regarded as specifications of the retreader for the retreaded tyre. If these original specifications do not apply after retreading they shall be completely removed.

8.5 The number of times tyre retreaded shall be marked on the tyre.

9 CRITERION FOR CONFORMITY

9.1 The retreading production unit shall conform to the requirements as per **4**.

9.2 The holder of the approval shall ensure that, during each year of production, and spread throughout that year, at least the following number of tyres, representative of the range being produced, is checked and tested as prescribed in this standard.

9.2.1 0.01 percent of the total annual production but in any case not less than 2 and not necessarily more than 10.

9.3 If the requirements of **9.2**. are carried out by or under the control of the approval authority, the results may be used as part of, or instead of, those prescribed in clause **9.4**.

9.4 The authority which has approved the retreading production unit may at any time verify the conformity control methods applied in each production facility. For each production facility, the type approval authority shall take samples at random during each and every production year and at least the following number of tyres, representative of the range being produced, shall be checked and tested as prescribed in this standard.

9.4.1 0.01 percent of the total annual production but in any case not less than 2 and not necessarily more than 10.

9.5 The tests and checks of **9.4** may replace those required in **9.2**.

10 BIS CERTIFICATION MARKING

The product may also be marked with the Standard Mark.

10.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clauses* 4.4.4 *and* 5.1)

METHOD OF MEASURING PNEUMATIC TYRES

A-1 The tyre shall be mounted on the test rim specified by the retreader and inflated to the nominal inflation pressure in relation to the maximum load carrying capacity for that size and load index.

A-2 The tyre fitted to the appropriate rim, shall be conditioned to the ambient temperature of the laboratory for at least 24 h.

A-3 The pressure shall be readjusted to the value given in **A-1.**

A-4 The overall width shall be measured at six equally spaced points around the tyre, taking account of the thickness of any protective ribs or bands. The highest measurement obtained shall be taken as the overall width.

A-5 The outer diameter shall be calculated for a measurement of the maximum circumference of the inflated tyre

A-6 Determine the outer diameter by measuring the maximum circumference and dividing the figure so obtained by π (3.1416).The tyre overall diameter shall be calculated by using the following formula:

$$D = \frac{C}{\pi}$$

where

D = tyre overall diameter, in mm; and

C = circumference of tyre tread, in mm.

ANNEX B

(*Clause* 6.1)

PROCEDURE FOR ENDURANCE TEST

B -1 PREPARING THE TYRE FOR TEST

B-1.1 Mount a retreaded tyre on the test rim specified by the retreader.

B-1.2 Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.

B-1.3 Inflate the tyre to the appropriate pressure corresponding to the pressure index as specified.

B-1.4 Condition the tyre and wheel assembly at test-room temperature for not less than 3 h.

B-1.5 Readjust the tyre pressure to that specified in **B-1.3**.

B-2 TEST PROCEDURE

B-2.1 Mount the tyre and wheel assembly on a test axle and press it against the outer face of a smooth surfaced power driven test drum either 1.70 m ±1percent diameter having a surface at least as wide as the tyre tread. In certain cases a 2.00 m ±1percent diameter drum may be used.

B-2.2 Apply to the test axle a series of test loads equal to a percentage of the load indicated in Annex A, corresponding to the load index indicated on the tyre, and in accordance with the test programme below. Where the tyre has load capacity indices for operation in both single and twin or dual formation the load corresponding to the load index for single operation shall be used for the test.

B-2.2.1 In the case of a tyre with a load index <121 and a speed symbol > *Q* (160 km/h), the test procedure shall be as specified in **B-3**.

B-2.2.2 For all other tyres the test procedure is as shown in Table 5.

B-2.3 ENDURANCE TEST PROGRAMME

B-2.3.1 The tyre pressure shall not be corrected

Table 5 Endurance Test Programme

(*Clause* B-2.2.2)

Sl No.	Load Index	Speed Symbol	Test Drum Speed		Load Placed on the Wheel as a Percentage of the Load Corresponding to the Load Index		
			Radial Ply rpm	Diagonal (Bias-ply) and Bias belted rpm	7 h	16 h	24 h
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	122 or more	F	100	100	66 percent	84 percent	101 percent
		G	125	100			
		J	150	125			
		K	175	150			
		L	200	—			
		M	225	—			
ii)	121 or less	F	100	100			
		G	125	125			
		J	150	150			
		K	175	175			
		L	200	175	70 percent	88 percent	106 percent
					4h	6 h	24h
		M	250	200	75 percent	97 percent	114 percent
		N	275	—	75 percent	97 percent	114 percent
		P	300	—	75 percent	97 percent	114 percent

NOTES

1 ‘Special-use’ tyres should be tested at a speed equal to 85 percent of the speed prescribed for equivalent normal tyres.

2 Tyres with load index **121** or more, speed categories N or P and the additional marking ‘LT’ included in the tyre size designation shall be tested with the same programme as specified in the above table for tyres with load index 121 or less.

throughout the test and the test load shall be kept constant throughout each of the three test stages.

B-2.3.2 During the test the temperature in the test room must be maintained at between 20°C and 40°C unless the tyre manufacturer or retreader agrees to the use of a higher temperature.

B-2.4 The endurance test programme shall be carried out without interruption.

B-3 LOAD/SPEED TEST PROCEDURE FOR TYRES WITH A LOAD INDEX ≤ 121 AND A SPEED SYMBOL ≥ Q (160 KM/H)

B-3.1 The load on the wheel and tyre shall be the following percentage of that corresponding to the load index of the tyre:

a) 90 percent when tested on a drum of 1.70m ± 1 percent diameter; and

b) 92 percent when tested on a drum of 2.00 m ± 1 percent diameter.

B-3.2 The initial phase test speed shall be 20 km/h less than that indicated by the speed symbol for the tyre,

a) time to reach initial test speed for 10 min.

b) the duration of the first phase for 10 min.

B-3.3 The second phase test speed shall be 10 km/h less than that indicated by the speed symbol for the tyre. The duration of the second phase for 10 min.

B-3.4 The final phase test speed shall be the speed corresponding to that indicated by the speed symbol for the tyre.The duration of the final phase for 30 min.

B-3.5 The duration of the entire test for 1 h.

ANNEX C

(*Clause* 7.1)

PROCEDURE FOR LOAD/SPEED PERFORMANCE TEST

C-1 PREPARING THE TYRE FOR TEST

C-1.1 Mount a new tyre on the test rim specified by the manufacturer.

C-1.2 Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.

C-1.3 Inflate the tyre to the pressure corresponding to the pressure specified by the manufacturer.

C-1.4 Condition the tyre-and-wheel assembly at test-room temperature for not less than 3 h.

C-1.5 Readjust the tyre pressure to that specified in **C-1.3**.

C-2 TEST PROCEDURE

C-2.1 Load placed on the wheel as a percentage of the load corresponding to the load index:

C-2.2 Ninety percent when tested on a test drum, 1.70 m ± 1 percent in diameter;

C-2.3 Ninety two percent when tested on a test drum, 2.0 m ± 1 percent in diameter.

C-2.4 Initial Test Speed

Speed corresponding to the speed category symbol less 20km/h;

a) Time to reach the initial test speed for 10 min; and

b) Duration of the first step for 10 min.

C-2.5 Second Test Speed

Speed corresponding to the speed category symbols less by 10 km/h. Duration of the second step for 20 min.

C-2.6 Final Test Speed

Speed corresponding to the speed category symbol (Reference speed).

a) Duration of the final step for 20 min.

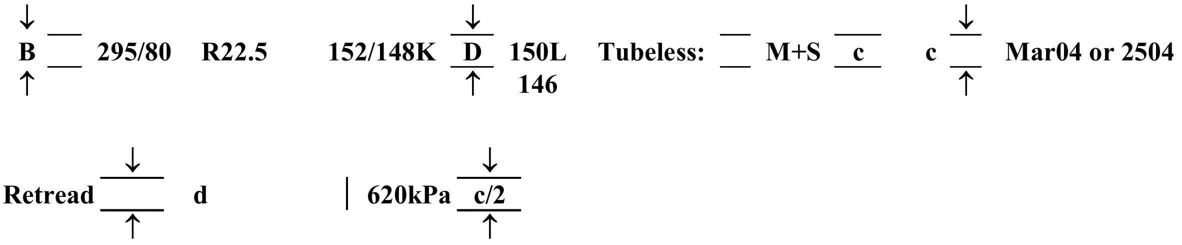
b) Total test duration for 1h.

ANNEX D

(*Clause* 8.1)

ARRANGEMENT OF RETREAD TYRE MARKINGS

D-1 EXAMPLE OF THE MARKINGS OF RETREADED TYRES



	Minimum Heights of Markings, mm	
	Tyres of Rim Diameter ≤ 20” or ≤ 508mm or of section width ≤235mm or ≤9”	Tyres of Rim Diameter ≥ 20” or ≥ 508mm or of section width ≥235mm or ≥9”
b	6	9
c	4	
d	6	

D-2 MARKINGS DEFINING A RETREADED PNEUMATIC TYRE

a) Nominal section width of 295;

b) Nominal aspect ratio of 80;

c) Radial-ply structure (*R*);

d) Nominal rim diameter of 572 mm, for which code is 22.5;

e) Load capacities of 3 550 kg (single) and 3 150 kg (twinned or dual), corresponding respectively to the load indices 152 and 148 given in Table 1;

f) Nominal speed symbol *K* (reference speed 110 km/h). Able to be used at the Unique point, speed symbol L (reference speed 120 km/h); with a load capacity of 3 350 kg (single) and 3 000 kg (twinned or dual), corresponding respectively to the load indices 150 and 146 given in Table 1;

g) Intended to be used without an inner tube (‘TUBELESS’); of snow type (M+S);

h) Retreaded month and year code , that is, in March of the year 2014 or in the weeks 25 of the year 2014; and

j) Requiring to be inflated to 620 kPa for load/speed endurance tests, for which the PSI symbol is 90.

D-3 POSITIONING AND ORDER OF THE MARKINGS CONSTITUTING THE TYRE DESIGNATION

a) The size designation, comprising the nominal section width, the nominal aspect ratio, the type-of-structure symbol (where applicable) and the nominal rim diameter shall be grouped as shown in the above example: 295/80 R22.5;

b) The service description comprising the load index and the speed symbol shall be placed near the size designation. It may either precede the size designation or follow it or be placed above or below it;

c) The symbols ‘TUBELESS’, ‘REINFORCED’, and ‘M + S’ may be at a distance from the size designation.

d) The word ‘RETREAD’ may be at a distance from the size designation symbol.

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This Indian Standard has been developed from Doc No.: TED 07 (10063).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi